Technology for Teachers: Another Perspective of the Implementation

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Abstract: As computer technology getting more and more advanced, educators have accepted the assumption that computer has a potential to renovate education and is necessary to enhance effective teaching and learning. However, computer is a tool and the value of this tool in education does not depend solely on its qualities (Maddux, Johnson, and Willis, 1997). It is its users, teachers and students, who make the difference. Teachers' creative use of available computing tools makes the teaching and learning more meaningful. Life long and self-paced learning is the key to the effectiveness of implementation. This paper is to review pre- and in-service teachers' computing literacy training in the past decades, discuss the current trends of computing education for teachers, and explore another perspective of implementation in pre- and in-service teachers' education.

Introduction

The growth and acceptance of computer technology in education have become undeniable, and computer application is believed having an important instructional role to play in the classrooms (Lockard, Abrams, and Many, 1997). Implementing technology in education is no longer the question of "should we or not" but "we must." Since the first computer was born in 1946, computer assisted instruction has experienced mainframe plus terminals stage, individual Apple or PC computer stage, and present network plus multimedia stage. As computer technology advances rapidly, educators have accepted the assumption that computers have a potential to renovate education and is necessary to enhance effective teaching and learning. However, computer is a tool and the value of this tool in education does not depend solely on its qualities (Maddux, Johnson, and Willis, 1997).

Computer literacy training

Computer-assisted instruction in education started in the early 60s and increased in the 70s. Since 1980s, more and more computers have entered schools, computer-assisted instruction has become a booming topic, and computer literacy is becoming a sensational buzzword in education. The assumption is that as far as teachers become computer literate, they will automatically use computers in the classroom and the potential of the computer technology in education will be unquestionably achieved. Therefore, computer literacy training for teachers is increasingly recognized. However, it is always a controversy topic. Started with programming centered approach, the teacher training has experienced with other

different approaches such as computing-curriculum focused, problem solving emphasized, and productivity tools anchored approaches. Each approach has had its proponents and defenders, and all have their critics. The common thread through the criticism has been that these approaches treat the computer as the subject matter, not the implementation.

Programming centered approach was dominated in teachers' computer literacy training in the early and middle of 1980s when microcomputers entered the schools in the late 1970s. Teachers attended the training mostly on BASIC (Beginners All-purpose Symbolic Instruction Code) language, few on PASCAL or COBOL languages. Teachers learned to write programs to tell computer what he or she wanted to do. Computer literacy therefore became a synonym of programming. Computers were then used for programming instruction instead of being implemented in curriculum-related instruction. The results of this approach turned out that a few teachers, mostly from math or science area, knew how to write and interpret a computer program to communicate with computers and became capable of designing simple drill and practice courseware. On the other hand, many educators just developed technophobia for themselves because of the training (LoCkard and Abrams and Many, 1997). Programming centered training seems to turn more teachers away from using computer technology than have teachers becoming computer literate to innovate their teaching.

Gradually, the computer literacy training was shifted to computing-curriculum focused approach. The literacy definition was broadened to become units or classes at different levels. With this approach, teachers received the training first on basic computer operating skills, such as how to boot up a computer and format disks. These were considered as "survival skills" that enable teachers to work effectively on a computer. Then the training was on the computer awareness. It was believed that the knowledge of computers would help teachers better understand what a computer can do and cannot do. Therefore, teachers were required to master the survival skills and become knowledgeable of the uses or misuses of computers before moving to the next level. The next level was application. Computing-curriculum was implemented across the existing curriculum or as new courses at various grade levels. Teachers at all levels and in all different disciplines were supposed to become "computer teachers," teaching computing unit for that grade. They learned to use word processors, spreadsheets, and database-management packages. It emphasized on the packages, which were available in each institution and could assist teachers to accomplish certain desired tasks. Programming was included in this approach; however, it was more considered as a skill to enhance students' ability to function as a problem solver. Logo programming language was taught in schools for the younger children and Pascal or Cobol for older students. This approach is no doubt helpful for some teachers to work at computers; however, one study of 125 Stanford professors in the middle of 1980s showed that 80% of them used computers to prepare lectures, handouts, and exams. About one quarter of them required students to write paper or analyze a database at computers. Examining the uses of computers in the classroom, it was found that only 13 out of 125 professors had actually blended the computer into their classroom (Cuban, 2000).

By the end of 1980s, developing problem solving ability became a universally accepted objective. The problem solving emphasized approach joined the computing literacy training. It tended to seek a new way to stimulate the use of computers in classrooms. However, few software packages were designed specifically for problem solving in depth. Although LOGO firmly dedicated to the mathematics problem solving, it was frequently taught as a change of pace, as a way to create pretty patterns, and as something separated from problem-solving. A survey conducted in 1989 among 660 faculty members in humanities and sciences found that 80% of the faculty members used computers to prepare handouts, 72% to design exams, and 62% to prepare lectures. In the classroom, only 10% actually used subject-related software (Cuban, 2000). The causes might be the time, the time to locate or develop problem-solving emphasized software and the time to conduct problem solving activities at computers. Problem solving approach turned out very time consuming and at the expenses of something else. Unless a teacher is firmly convinced of the value of the problem solving activity, comfortable and skillful in presenting it, he or she is unlikely to adopt it in the classroom voluntarily. Therefore, problem solving emphasized approach usually had a sensational start and ended as a product of miscarriage.

When computer literacy training turned against programming approach, found the computer-curriculum model difficult to implement, and proved problem solving was not realistic, productivity tools anchored approach merged in. In the early 1990s, there was a trend of looking at the computer as a tool and believing its effectiveness depends on the person's skills of using this tool. Followed was a teacher preparation program renovation, in which almost every teacher preparation program in the United States included either required or elective education technology courses to satisfy NCATE review. Computing

literacy training for teachers was therefore transited to the focus of productivity tools and applications one after another. The common sequences of the training were basic operating skills, word processor, spreadsheets, database, E-mail, and finally multimedia and WWW. The courses tended to provide teachers with the knowledge and skills of using these productive tools. Yet, a faculty survey in 1994 found even worse results of using technology in the classroom. 59% of 750 professors who taught undergraduates said that they never used a computer in the classroom; 19% of them used the computers occasionally and only 8% said that they used computes often. Since 1994, even much evidence of frequent use of E-mail and Internet among faculty and students occurs, less than 10% of the Stanford faculty frequently use these new technologies increasingly. Low-tech teaching exists in high-tech schools (Cuban, 2000).

Current computing education for teachers

Computing education for teachers nowadays is facing the challenge of how to integrate appropriate technologies and strategies for maximum learning. Since 1980s, computers have flooded into schools. Compared with the academic year of 1983-1984, the ratio of students to computers in the school has changed from 125:1 to 12:1 in 1995. A research has found that never a case in the history of American education has so much money been spent with so little thought given to implementation and so little demanded in return (Lockard, Abrams, and Many, 1997). NCATE has set the integrating computer technology in education as one of its criteria for the review of teacher education programs; however, what had been expected to happen did not occur. The implementation is still in struggling, like one jumping on the buses but having no clear destination.

The arguments of computing education for teachers are focused on the question that whether it should be technology course(s) driven or technology/curriculum combination driven in teacher education programs. The former is in favor of keeping or creating computing technology courses in the teacher education program. These technology classes provide pre-service or in-service teachers with different level of computing skills and strategies. It is believed that as far as teachers master these skills and strategies, they will automatically implement technology in their classrooms. The latter prefers to embed computing skill into all courses in the teacher education program, having computing skills and strategies integrated into each specific class. It is believed that pre-service teachers or in-service teachers who have enrolled in teacher education programs will gain the computing skills and strategies bit by bit and eventually be able to use the technology in their classrooms.

Most teacher education programs with technology courses-driven are more likely to have one or two required courses dedicated to the computing education. The courses usually cover productivity tools, e-mail and Internet skills, and multimedia productions. Curriculum/technology combination-driven program requires each curricular content course to integrate one or two computing skills and has course assignments reflect these skills. Should those technology courses be considered as required components in a teacher education program or be eliminated but have each curricular content course covers one or two technological skills? To be or not to be, that is still the question.

Rapid changes in technology pose another challenge for computing education for teachers in the current. Oblinger (2000) believes that these changes are due to four major technologies that will have an impact on global education in the 21st century. The four major technologies are processing power, digitization, networks, and storage. The rapid growth in microprocessor performance doubles every 18 months. It is predicted that the clock rates will move ahead and exceed one GHz or billions of instructions per second within the next decade. Digitization makes more work shifted from physical to virtual, and more new value-added services become possible by re-shuffling pre-existing information in new forms. Increasingly developed network makes it possible to transmit close to 1.2 gigabits of information over a network with current capabilities. That is roughly to transmit 85 books or 39,000 pages of text per second. Data storage has been expended so dramatically that it allows the text of 375 average-sized novels to be stored in a single square inch of disk surface. It is estimated that a high-density CD will have the capacity to store six billion bytes of information, equivalent roughly to one million pages of text.

Because of these rapid changes, technology will become an accepted tool for almost everyone and everything. The virtual will displace the physical for many tasks. The cost of technology is going down, and the access to the technology is becoming increasingly easier. Ideally, the lower costs and improved ease-of-use will allow teachers to use computers more often and implement technology in instruction and learning more effectively. However, few of us need reminders of the rapid pace in the technology industry. It is not difficult to realize that a computer may become out-of-date almost as soon as it is purchased, and

the technology training a teacher receives is no longer applicable almost as soon as he or she goes back to teaching in the classroom. Upgrading software and hardware is taking schools and teachers enormous time, energy, and money to catch up with the current. Should we or can we take a breath to think about how to make the implementation more meaningful or keep catching up exhaustedly with increasingly advanced technology? It is the question looking for an answer.

Another perspective of implementation

Computer is a tool. The actual value of the tool does not solely depend on its quality of advances. Creative use of the tool can make the difference. Common tools, such as Microsoft office and ClarisWorks, have more potentials to help teachers and students build up their dreams. Word processor has more powerful uses than paper writing; spreadsheet is not limited in compiling grade sheets; database can definitely go beyond the student records keeping; and PowerPoint is not only a presentation tool for teachers at all. The authors believe that unless teachers and students use the tool creatively, the implementation can become meaningful. The approaches of integration and applicable strategies of implementation can only be constructed with teachers' curiosity and enthusiasm of using the common tools, and the implementation can only be meaningful when these common tools are aligned with curricular contents.

Facing the rapid changes of computing technology, life long and self-paced learning is a key to the effectiveness of implementation. Obtaining technology training once or twice or having one or two technology classes is not enough. No single teacher education program will be able to provide schools with a fully and permanent qualified professionals. Few of us can anticipate what technology will be available a few months or years from today.

Therefore, implementing technology in teacher education program needs to emphasize the creative use of common tools, such as productivity tools (word processing, spreadsheet, database, and presentation tools), Internet and WWW resources, and multimedia applications. Since these common tools are available in the majority of schools and classrooms, let us have them integrated into disciplinary curriculum and make them be meaningful in teaching and learning. Technology courses will help teachers to master the use of these tools. Alignment of these tools with curricular disciplines will enhance the technology implementation in teacher education program. Meanwhile, teacher education program should encourage pre-service and in-service teachers to work collaboratively and to be initiative to explore new technologies whenever they become available. The commitment of being a life long learner is critical for a teacher to upgrade his or her implementation skills and improve the effectiveness of teaching and learning.

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